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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte JAMES R. ROSSEAU

Appeal 2008-1093
Application 10/723,291
Technology Center 3600

Decided: June 30, 2008

Before: WILLIAM F. PATE, III, LINDA E. HORNER, and STEVEN D.A. McCARTHY, *Administrative Patent Judges*.

McCARTHY, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

The Appellant appeals under 35 U.S.C. § 134 (2002) from the final rejection of claims 1-10. We have jurisdiction under 35 U.S.C § 6(b) (2002).

The claims on appeal relate to a system to accurately monitor tire pressure imbalance through the measurement of distance by way of digital pulse devices. (App. Br. 3.) More specifically, the system makes use of wheel rotation sensors which generate a predetermined number of pulses for each revolution of the wheel as in an anti-lock brake system ["ABS"]. (Spec. 5, ¶ 0018). Independent claim 4 is typical of the appealed claims and reads as follows:

> 4. A system of determining tire pressure faults in a vehicle comprising:
>
> determining distances a plurality of tires have traveled;
>
> comparing the distances to determine if a pressure fault has occurred in said plurality of tires.

Claims 1-10 stand rejected under 35 U.S.C. § 103(a) (2002) as being unpatentable over Okawa (U.S. Patent 5,591,906) in view of Sharp (U.S. Patent 5,569,848) and Jackson (U.S. Patent 6,237,234).

We AFFIRM.

ISSUE

The primary issue in this appeal is whether a system or method which determines distances a plurality of tires have traveled and compares the distances to determine if a pressure fault has occurred in said plurality of tires would have been obvious to one of ordinary skill in the art from the combined teachings of Okawa, Sharp, and Jackson.

FINDINGS OF FACT

The record supports the following findings of fact ("FF") by a preponderance of the evidence.

1. Okawa teaches a vehicle equipped with an ABS and a tire pressure drop detecting device. (Okawa, col. 6, ll. 11-14.)

2. The ABS includes a wheel speed sensor associated with each wheel. (Okawa, col. 6, ll. 15-20 and Fig. 1.)

3. Each wheel speed sensor generates a voltage signal having a frequency corresponding to the frequency with which teeth projecting at a predetermined pitch from a sensor rotor fixed to the wheel shaft of the corresponding wheel disrupt a magnetic field. (Okawa, col. 7, ll. 1-15.)

4. Okawa teaches that "the amount of the change in the rotational angular velocity of the tire whose pneumatic pressure drops is detected utilizing the rotational angular velocities of the three other normal tires as a reference amount." (Okawa, col. 4, ll. 26-31.)

5. Okawa further teaches that "[t]he rotational angular velocity of the tire is detected by, for example, giving each tire the construction for generating pulses proportional to the rotation of the tire and counting the generated pulses within a predetermined measuring period." (Okawa, col. 4, ll. 52-56.)

6. Sharp teaches a system and method which monitors tire pressure and, if the pressure drops below a predetermined threshold value, indicates which tire is low. (Sharp, col. 8, ll. 47-53.)

7. Sharp teaches that the distance that a tire travels per revolution is smaller for underinflated tires than for normally inflated tires. (Sharp, col. 4, ll. 13-15.)

8. In Sharp's system, a wheel speed sensor is associated with each wheel assembly. Each wheel speed sensor consists of a toothed ring affixed to rotate with the associated wheel assembly and a sensing unit operably associated with each toothed ring. (Sharp, col. 8, ll. 14-21.)

9. In Sharp's method, a computer reads the wheel speed signal from each wheel speed sensor at a timed interval such as thirty times per second. (Sharp, col. 9, ll. 18-24.)

10. The computer calculates the average rotational speed for three of the wheels. (*Id.*)

11. The computer then compares the rotational speed of the fourth wheel (the target wheel) to the average rotational speed of the three wheels to determine the percentage difference between the rotational speed of the fourth wheel and the average rotational speed of the three wheels. (Sharp, col. 9, ll. 18-30.)

PRINCIPLES OF LAW

A claim is unpatentable for obviousness under 35 U.S.C. § 103(a) if "the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains." In *Graham v. John Deere Co.*, 383 U.S. 1 (1966), the Supreme Court set out factors to be considered in determining whether claimed subject matter would have been obvious:

> Under § 103, the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained;

> and the level of ordinary skill in the pertinent art resolved. Against this background, the obviousness or nonobviousness of the subject matter is determined.

Id., 383 U.S. at 17.

ANALYSIS

A. The Rejection of Claims 1-8 Under § 103(a) as Being Unpatentable Over Okawa in View of Sharp and Jackson

The Appellant contends that independent claims 1, 4, and 6 "include elements directed to a distance based tire pressure fault. The cited references are silent with respect to a distance based tire pressure fault." (App. Br. 8.) The Appellant presents no other argument concerning the rejections of claims 1-8 and we understand the Appellant to have grouped these claims for purposes of this appeal. *See* 37 C.F.R. § 41.37(c)(1)(vii) (2007). We choose claim 4 as being representative.

The first issue to address is the interpretation of the word "distance" as used in claim 4. "Distance" cannot mean the absolute distance that the center point of the tire travels; since the frame of a vehicle is rigid, all tires on a vehicle travel the same absolute distance absent slip and a comparison of the absolute distances traveled by different tires would be meaningless. Instead, we interpret the term "distance" as used in claim 4 as being broad enough to encompass the raw number of pulses generated by a wheel speed sensor as taught in Okawa and Sharp which are accumulated during a timed interval. It is in this sense that the Appellant's Specification speaks of the digital pulses generated by the proximity sensors "representing the distance

traveled by the wheel." (*E.g.*, Spec., Abstr., ll. 9-10.) The Appellant has pointed to nothing in the Specification inconsistent with this interpretation.

In *KSR Int'l Co. v. Teleflex, Inc.*, 127 S.Ct. 1727, 1741 (2007), the Supreme Court held that when an application "claims a structure already known in the prior art that is altered by the mere substitution of one element for another known in the field, the combination must do more than yield a predictable result." *Id.*, 127 S.Ct. at 1740. Okawa teaches an ABS-based system for detecting a tire pressure drop. (FF 1.) Sharp also teaches a system and method which indicates underinflated tires. (FF 6). The two systems measure tire rotation by means of similar sensors. (*Compare* FF 3 *with* FF 8.) Sharp's system compares the rotational speed of the fourth wheel to the average rotational speed of the three wheels to determine whether the fourth tire is underinflated (FF 11), whereas Okawa teaches detecting an amount of change in the rotational angular velocity of a tire whose pneumatic pressure drops by using the rotational angular velocities of the three other normal tires as a reference (FF 4.) In light of these interconnected teachings, it would have been obvious to one of ordinary skill in the art to have substituted Sharp's methods for sampling the outputs of the wheel speed sensors and for comparing the rotations of the tires into Okawa's ABS-based system. In light of the similarities of the two systems, the result of the substitution would have been predictable.

The ABS-based system of Okawa modified to determine whether a target tire is underinflated by means of the method taught by Sharp would have determined the distances a plurality of tires have traveled by accumulating pulses from the wheel speed sensors. Sharp teaches that "wheel speed signals" are "read" from each sensor (FF 9, citing Sharp, col.

9, ll. 18-24); that the computer calculates the average rotational speed for three of the wheels (FF 10); and that the computer then compares the rotational speed of the target wheel to the average rotational speed of the other three wheels to determine the percentage difference between the rotational speed of the target wheel and the average rotational speed of the three wheels (FF 11). It was well known at the time the invention was made that the rotational speed is proportional to the quotient of the number of pulses generated by a wheel speed sensor in a timed interval divided by the length of the timed interval. (Okawa, col. 9, ll. 16-27.) Sharp does not disclose dividing the counts of pulses from the wheel speed sensors by the length of the timed interval over which the pulses are accumulated so as to convert the counts of pulses from measurements of distances traveled by the tires to true rotational speeds. These facts imply that Sharp actually compares "distances," that is, raw numbers of pulses accumulated in particular timed intervals, as proxies for rotational speeds to determine if a pressure fault has occurred in the plurality of tires.

Even if one were to assume that Sharp does not inherently disclose comparing "distances" traveled by the four tires to determine whether a target tire is underinflated, it would have been obvious to one of ordinary skill in the art to compare "distances" for this purpose. The signals read directly from the wheel speed sensors would be "distance" signals, that is, raw numbers of pulses generated by the wheel speed sensors during the time interval. (FF 5.) One of ordinary skill in the art would have recognized the need to perform an additional step not expressly taught by Sharp, namely, dividing the raw number of pulses generated by the wheel speed sensor

associated with each wheel by the length of the timed interval, in order to obtain true rotational speeds for comparison. (*See* Okawa, col. 9, ll. 16-27.)

Sharp expressly teaches determining whether a target tire is underinflated by calculating the percentage obtained by dividing the rotational speed of the target tire by the average rotational speed of the other three tires. (FF 11.) Sharp also teaches that the "wheel speed signals" for all four tires are read during the same timed interval. (FF 9.) One of ordinary skill in the art would have recognized that the numerical percentage obtained by dividing the "distance" signal, that is, raw number of pulses, generated by the wheel speed sensor associated with the target wheel by the average "distance" signal, that is, the average of the raw numbers of pulses, generated by the wheel speed sensors associated with the other three wheels would be the same numerical percentage obtained by first dividing the raw numbers of pulses counted during a timed interval by the length of the timed interval to obtain rotational speeds and then dividing the rotational speed of the target wheel by the average rotational speed of the other three wheels. In other words, performing the additional calculational step required to convert the "distance" signals to calculated rotational speeds would not affect the numerical percentage used to determine if the target tire is underinflated. Even if one were to assume that Sharp does not inherently disclose comparing "distances" traveled by the four tires, it would have been obvious to modify Sharp's method so as to compare "distances" the four tires have traveled to restrict the number of calculational steps required to determine whether a target tire is underinflated.

On the record before us, the Appellant has not shown that the Examiner erred in rejecting claims 1-8 under § 103(a) as being unpatentable over Okawa, Sharp, and Jackson.

B. The Rejection of Claims 9 and 10 Under § 103(a) as Being Unpatentable Over Okawa in View of Sharp and Jackson

The Appellant contends that dependent claims 9 and 10 "include elements that specifically negate the use of speed and time to determine a tire pressure fault. The cited references clearly require the use of speed and time with reference to a tire pressure fault." (App. Br. 8.) In the previous section of this opinion, we concluded that it would have been obvious to one of ordinary skill in the art to have substituted Sharp's methods for sampling the outputs of the wheel speed sensors and for comparing the rotations of the tires into Okawa's ABS-based system. In addition, we concluded that the modified system would have either compared "distances," that is, raw numbers of pulses accumulated during a timed interval, to identify an underinflated tire or that it would have been obvious to one of ordinary skill in the art to further modify the system so as to compare only raw numbers of such pulses. The system so modified would not use speed to determine a tire pressure fault or determine a tire pressure fault in a manner dependent on time. On the record before us, the Appellant has not shown that the Examiner erred in rejecting claims 9 and 10 under § 103(a) as being unpatentable over Okawa, Sharp, and Jackson.

CONCLUSIONS OF LAW

On the record before us, the Appellant has not shown that the Examiner erred in rejecting claims 1-10 under § 103(a) as being unpatentable over Okawa in view of Sharp and Jackson.

DECISION

We AFFIRM the Examiner's rejection of claims 1-10.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a). *See* 37 C.F.R. § 1.136(a)(1)(iv) (2007).

AFFIRMED

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